

PROCEEDINGS
OF
THE ROYAL SOCIETY.

November 15, 1894.

Sir JOHN EVANS, K.C.B., D.C.L., LL.D., Vice-President and
Treasurer, in the Chair.

Professor J. V. Jones and Mr. R. Lydekker were admitted into the
Society.

A List of the Presents received was laid on the table, and thanks
ordered for them.

In pursuance of the Statutes, notice of the ensuing Anniversary
Meeting was given from the Chair.

Professor D. E. Hughes, Professor A. B. W. Kennedy, and Pro-
fessor A. W. Rücker were by ballot elected Auditors of the Treasurer's
accounts on the part of the Society.

The following Papers were read :—

- I. "Further Observations on the Organisation of the Fossil
Plants of the Coal-Measures. Part 2. The Roots of *Calamites*." By W. C. WILLIAMSON, LL.D., F.R.S., Emeritus
Professor of Botany in the Owens College, Manchester;
and D. H. SCOTT, M.A., Ph.D., F.R.S., Honorary Keeper of
the Jodrell Laboratory, Royal Gardens, Kew. Received
October 31, 1894.

(Abstract.)

Until quite recently our knowledge of the adventitious roots of
Calamites was limited to their external form and position on the stem.
Though the structure of the stem itself was so well known, we
remained in complete ignorance of the internal organisation of the
roots.

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M. Renault, in 1885, expressed the opinion that the fossils originally described by Dr. Williamson under the name of *Astromyelon*,* in which the structure is well-preserved, were the roots of *Arthropitites* (our *Calamites*) and *Calamodendron*. He has now found conclusive proof of the truth of this hypothesis, and in his latest work† he gives numerous figures of roots, with *Astromyelon* structure, arising as appendages on the stems of *Calamites*, *Bornia*, and *Calamodendron*.

It therefore became necessary to reinvestigate our English specimens of *Astromyelon Williamsonis* (from which the French fossils are said to be specifically distinct) in order to ascertain their true nature.

A specimen in the Williamson collection shows clearly three appendages with the typical structure of *Astromyelon*, arising from a main axis which shows structural features characteristic of a Calamitean stem. M. Renault's conclusion may, therefore, safely be extended to the English specimens.

The structure of the fossils hitherto known as *Astromyelon Williamsonis* has been examined in detail, with a view to determining their morphological nature. It is found that they present, in all respects, the characteristics of roots, so far as these can be recognised in fossil plants.

In the larger specimens, such as have been found in direct connection with the stem of *Calamites*, there is a well-marked medulla, which is surrounded by a ring of primary xylem-strands, varying in number, from twenty-five downwards. The development of each xylem-strand was centripetal, for the spiral tracheides lie at the external angle of each strand.

In well-preserved specimens, at an early stage of development, the primary phloëm can be recognised, alternating with the primary strands of wood. These anatomical features are characteristic of the roots of all vascular plants.

The secondary wood, which has been observed at all stages of development, agrees in structure with that of the stem of *Calamites*. In favourable cases the cambium can be seen, and secondary phloëm has also been found.

The mode of branching is shown to be *endogenous*.

There is some evidence that these organs have a double endodermis, as is the case in the roots of the recent *Equiseta*.

At the exterior of the cortex (which always had a lacunar zone) a protective epidermoidal layer was formed, probably arising from the

* See Williamson, "Organisation of Fossil Plants of Coal-Measures, Parts IX and XII," 'Phil. Trans.,' 1878 and 1883; Renault, "Genre *Astromyelon*," 'Ann. des Sci. Géologiques,' vol. 17, 1885, and 'Mém. de la Soc. des Sci. Nat. de Saône et Loire,' 1885.

† 'Flore Fossile d'Autun,' &c. Part 2. 1893.

cells next below the actual epidermis. This feature occurs in many recent roots.

It is shown incidentally that the doubts expressed by Messrs. Hick and Cash as to the identification of their "*Myriophylloides*" with "*Astromylon*" are unfounded. A section of the type-specimen of "*Myriophylloides*" has been re-examined, and its structure is shown to be identical with that of the other specimens of "*Astromylon*."

The numerous minute rootlets, associated with the larger roots, have been carefully examined. Many of these rootlets are without any pith, but they are in other respects identical with the typical specimens, with which they are connected by an unbroken series of intermediate forms. There are also instances in which rootlets are found inserted upon the medullate roots.

The conclusions at which the authors arrive are the following:—

1. The fossils hitherto described under the name of *Astromylon Williamsoni* are the adventitious roots of *Calamites*.

2. Their structure is in all respects that characteristic of roots, as is proved by the centripetal primary wood, the alternating strands of primary wood and phloëm, the endogenous mode of branching, and the absence of nodes.

3. The smallest specimens, with little or no medulla, represent the finest branches of the same roots, of which the large medullate forms are the relatively main axes.

The paper is illustrated by micro-photographs from the actual specimens, and also by *camera-lucida* drawings.

II. "On the Ascent of Sap." By HENRY H. DIXON, B.A. Assistant to the Professor of Botany, Trinity College, Dublin, and J. JOLY, M.A., Sc.D., F.R.S. Received October 16, 1894.

(Abstract.)

Strasburger's experiments have eliminated the direct action of living protoplasm from the problem of the ascent of sap, and have left only the tracheal tissue, as an organised structure, and the transpiration-activity of the leaf, wherein to seek an explanation of the phenomenon. The authors investigate the capability of the leaf to transpire against excessive atmospheric pressures. In these experiments the leaf was found able to bring forward its water menisci against the highest pressures attained and freely transpire. Whether the draught upon the sap established at the leaf during transpiration be regarded as purely capillary or not, these experiments lead the authors to believe that it alone is quite adequate to effect the eleva-